per cent. In some localities late corn is almost a complete failure, although the damage is not so great in the western counties as in most of the middle and eastern portions. Cotton did not suffer much until about the middle of August. It is now, September 17, damaged probably 10 to 15 per cent by drought. Tobacco plants are small in many fields and the leaves are badly burned. Peanuts will probably not make more than a fourth of a crop, as the drought came at a critical time for them. Late cuttings of hay will amount to little, and pastures are dried up almost everywhere except in favored spots. Plowing for fall crops has, of course, been delayed and farm work seriously affected thereby.

The water supply is giving out in many localities, and in a few places it is reported scarcer than ever known before. But over most of the State there has been only inconvenience, not actual suffering, on account of lack of water, as many springs and streams have been available where wells gave out. Many hogs and cattle are being sold at great disadvantage on account of dried-up pastures and scarcity of feed.

It is not believed that the drought of 1913 is unsurpassed in its damaging effects upon crops, but it is among the worst in the last 30 years. June was very favorable for cultivation and the first half of July received rains which prevented serious damage to corn until about the 1st of August, by which time a good portion of the corn had fairly matured. Cotton was fine until the middle of August. Late crops of all kinds were very seriously damaged.

DROUGHT AND HEATED PERIOD OF 1913 IN ILLINOIS.

By H. M. WILLS, Acting Section Director, Springfield, Ill.

A careful study of the climatological records of Illinois reveals the following facts in connection with the heat wave and drought of the summer of 1913: The summer mean temperature is the highest on record in Springfield and the State mean is the highest on record for the State, with the single exception of the year 1901, which was but a fraction of a degree above this season's record. The maximum temperature during the period was the highest on record for Springfield, except the year 1901, and the State maximum was the highest, except 1901 and the year 1911, when the record was equaled. Both Springfield and State records for number of days with 90° or over are without precedent, except that 1901 exceeded this year's record for 100° or over, in Springfield. That was one of the prominent features of the heat wave of 1913, the daily temperatures remaining high during long periods and in many instances without much relief at night.

The Springfield total precipitation for June, July, and August, 1913, is the least on record since 1908, with but three other years showing smaller amounts, while the State total is the lowest since 1894, and there were but three other years with lower records than 1913. The large deficiency of this season's fall as compared with the average during the last 36 years is noteworthy.

Special features of the drought and heat wave are brought out in more or less detail in the following description:

Deficiency in rainfall and abnormally high temperatures began early in May in many sections of the central and south portions of the State and in several cases date back to the middle of April. The May totals were 2 to 4 inches below normal over the south two-thirds of the State, while the falls were equally excessive over the north one-third. High maxima occurred, breaking records for May in some counties. The drought was becoming serious at the close of the month, affecting vegetation materially.

It continued dry and warm through the first two decades of June, with crops suffering from the drought. Oats began heading very short, due to the stunted condition from the drought; corn did not germinate, and pastures were short, but the situation was somewhat relieved in sections by beneficial rains from the 21st to 25th of the month. The monthly total was the lowest on record for June in the extreme south. Maximum temperatures were high from the 15th to 21st breaking June records in many counties of the central and south portions. The last few days were very hot, the temperature reaching or exceeding 100°. The temperature at Springfield continued above normal through the entire month, except from the 7th to 12th. Eight fatal prostrations were reported in the State (excluding Chicago), and no doubt a much greater number occurred that were not reported to us. A great number of horses died, and miners were reported to have quit work on account of the heat.

The same droughty conditions continued through the greater part of July becoming most serious over the west-central and east-central portions. Although generous rains fell over limited portions of the northwest and the extreme southwest, the major part of the State received little rain, and least July records were broken in many localities (Peoria dating back to 1856), and the absolute minimum for any month was recorded at La Harpe and Monmouth. Most rains were of the thundershower type and covered limited areas. Lack of rain in the north third was not felt much until the latter part of the month on account of the abundant rains of May and June, but the south two-thirds suffered greatly. Reporters stated that wells were going dry and springs and streams that had never been known to go dry were without water; and dust in country roads was apparently bottomless. Water hauling by railroads and stock raisers and others was a frequent occurrence; ground became parched and crops suffered greatly from the severe drought; vegetation turned yellow and much of it withered; and corn began firing badly during the latter part of the month. The temperature reached the high mark of the season, 108° near the middle or end of the month. One observer recorded the highest on record for the station. There were a large number of heat prostrations in the State, and one observer reported horses dying in his vicinity at the rate of one a day during harvest.

In the August reports the observers continued to mention the effects of the hot dry weather on vegetation, but the drought was partially relieved in many counties during the first half of the month, while in other sections the situation was not relieved until the middle of September, and in a few localities observers report the continuance of the drought at the present writing (September 27). The greatest deficiencies in the August rainfall occurred in the south and west-central portions, while the fall was excessive over the extreme northwest. The least August records were broken in many localities. The north fourth of the State was fairly well watered while no county in central or southern Illinois had sufficient rains up to the end of August. The maximum temperature was near or above 100° throughout the greater part of the month and at Springfield there were but two days below normal. Previous high temperature records were equaled or exceeded at 22 stations.

Briefly summing up the above, the drought of 1913, which began in May over central and southern Illinois, continued to grow worse until the third decade of June, when it was somewhat relieved by generous rains in some sections but continuing in other sections until the fore part of August, when beneficial rains fell in many localities, while in still others it continued almost unabated until the middle of September. During the latter part of September good rains appear to have completely broken the drought in almost every section of the State.

The following statement, which shows in percentage the extent to which the drought and heat wave damaged the staple crops of the State, has been assembled from estimates received from cooperative observers on September 24: Corn damaged, 44 per cent; wheat damaged, 4 per cent; oats damaged, 61 per cent; hay damaged, 39 per cent; apples damaged, 32 per cent; pears damaged, 26 per cent; peaches damaged, 21 per cent; potatoes damaged, 65 per cent; sweet potatoes damaged, 58 per cent; Tomatoes damaged, 52 per cent; beans damaged, 54 per cent.

DROUGHT AND HEAT WAVE OF 1913 IN INDIANA.

By VERNE H. CHURCH, Section Director.

The drought and heat wave which prevailed over many States in the Middle West, and was noteworthy for its length and severity, extended into Indiana from the southwest and covered from one-third to two-fifths of the State. The extreme southwestern counties and a narrow strip along the west side of the State as far north as Terre Haute suffered the most severely, because of a deficiency of moisture as early as the month of April, whereas the remainder of the drought area received more than the normal amount of precipitation in April, thereby shortening the dry season in those sections by a month or more, and affording ample moisture at a time when it was most essential for the germination of spring crops. Some of the stations farther east and north received an excess of rain in July and August, which practically terminated or at least greatly relieved the droughty conditions in those districts.

The rainfall during the months of April to August, inclusive, consisted mainly of local showers. These occurred in many cases over comparatively small areas, causing the line of demarcation between dry and moist areas to be sharply drawn. Prof. E. E. Ramsey, cooperative observer at Bloomington, says:

> The rains have been local in an abnormal degree. Distances of 200 feet are sufficient to separate areas of good showers from areas receiving no rain. The east side of Monroe County has had rain sufficient for all purposes during the entire summer. In this narrow belt, which extends into Brown County, the crops are above average.

Many of the local showers were extremely heavy, which materially lessened the deficiency in rainfall but failed to benefit crops in proportion to the measured quantity which fell, because of excessive run-off and diminished absorption due to the unusual density and hardness of the soil.

From April to August, inclusive, the deficiency in precipitation over the drought area ranged from 3 to slightly more than 10 inches. The portions of the State where the deficiency was less than 3 inches suffered little more during the driest periods than in the average summer season. In the driest districts, however, the drought was said to have been the severest since 1881, which was prior to the establishment of a cooperative meteorological service, hence no records for that year are available for comparison.

The destructiveness of the drought was greatly augmented by the prevalence of unseasonably hot weather from about the middle of June to the latter part of August. The mean temperature for the State was above normal for each of the months under discussion, and the temperatures at individual stations universally exceeded the seasonal average during June, July, and August. The hottest period of the summer prevailed from June 15 to July 5, inclusive. During this time maximum temperatures of 90° or above were recorded on practically every day at nearly all stations, and temperatures of 100° or above were reached at most stations in the drought district on one or more days.

Probably the hottest previous summer on record was was that of 1901. However, the conditions were very different in that year. April and May, 1901, were deficient in temperature, whereas in 1913 there was a slight excess; June experienced practically the same temperature in the two years; July, 1901, was extremely hot, while August of that year was cooler than August, 1913. Therefore the hot summer of 1901 can be attributed chiefly to the abnormally hot weather in July of that year. The hot weather of that summer was more uniformly distributed over the State. In that year there were 13 stations with an average of 7 more days with a temperature of 90°, or above, than in 1913. Those stations were all in the north half of the State, except two. The two in the southern half had an excess of only one day each. On the other hand, there were 21 stations having an average of 14 more days with like temperatures in 1913 than in 1901, these stations all being situated in the southern half and extreme western part of the northern half of the State. Therefore it may be stated that the portion of the State under discussion experienced a hotter summer, as a whole, in the current year than in any other year for which records are available.

Hot winds also played an important part in increasing the intensity of the drought, especially during the hot spell in June, and damage to fruit from this cause was also observed in August. Reports have also been received of the loss of some fruit and forest trees from the same cause. In the vicinity of Mount Vernon, where 600,000 pounds of pecans were grown last year, the report is current that the crop is an entire failure this year.

Reports from various sources indicate that the damage to the wheat crop by drought was almost negligible, but all other crops suffered severely. Oats in most cases were too short and too light to be cut with a binder. Hay was extremely short and light. Early potatoes were a complete failure, and late potatoes give promise of only a very light crop. The tobacco crop is very light, and gardens were mostly failures. The tomato crop will not exceed 50 per cent of a normal yield. Corn suffered severely, but will be a better crop than any of the others except wheat, especially on bottom lands.

The water supply was greatly affected. Many wells and small streams became dry, and farmers were compelled to haul water considerable distances from rivers or other sources. A canning factory at Underwood and a power plant at Charlestown were kept in operation by hauling water from Jeffersonville in tank cars. The Baltimore & Ohio Southwestern Railroad Co. was compelled to run a water train from Jeffersonville for several weeks. Live stock suffered much from the scarcity of water, as it was necessary to haul water to them or drive them long distances. This extreme condition was confined to small localities however.